Common Maneuver Networks Representation Towards Interoperability of C4ISR and M&S

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Overview

- Purpose of Briefing
- Programmatics/Acknowledgements
- Issue, Objective, & Payoff
- Products
- CMN Focus
- Approach
- Summary

Purpose

- **To provide an overview of the Common Maneuver Networks project**

Programmatics/Acknowledgements

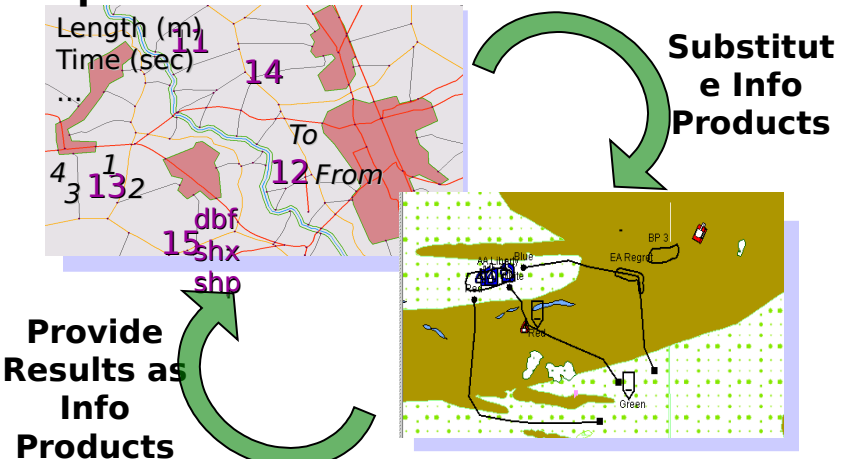
- **ERDC Research Development Test and Evaluation Work Package (6.2)**
- **Timeline: FY04-FY07**
- **Core Team:**
  - **Dr. Niki Goerger, ERDC, WP Manager**
  - **Dr. Paul Richmond, ERDC**
  - **Mike Pace, ERDC**
  - **Burhman Gates, ERDC**
  - **MAJ Nick Wittwer, TRAC MTRY**
  - **Curt Blais, NPS MOVES**

WP = Work Package

Common Maneuver Networks: Issue, Objective, & Payoff

- **Issue**:
  - **Current Battle Command (BC) and Embedded Training (ET) systems do not share a common representation of the environment or many analysis services, including those associated with tactical maneuver data**
  - **This commonality is needed to achieve a Common Operational Picture (COP) and enable the Future Force/Future Combat System (FCS)**

Sample BTRA Maneuver Network



- **Objective**: **To develop of prototype capability for sharing tactical maneuver data and information products between BC and ET systems**
  - **Using OneSAF Objective System (OOS) and Battlefield Terrain Reasoning and Awareness (BTRA) products**

- **Payoff**:
  - **Common, consistent representation of elements of the COP to enable BC and M&S interoperability**
  - **Standardization with broader community initiatives for DoD, Joint, and Coalition Forces**

Reference: Exercise Battle Command Integrated Process Document (FCS LSI); Sep 03; Embedded Training Section

Products

- **Common Operational Picture elements for maneuver potential in BTRA and OOS**
- **Data model analysis and recommended schema for correlated data features and attributes**
- **Framework for data exchange to ensure interoperability between OOS and C4ISR (based on BTRA products)**
- **Scaling and adaptive algorithms between entity and aggregate level maneuver networks**
- **Extensible procedures to correlate or synchronize behaviors between BTRA and OOS**

CMN Focus

correlation

COA
Development/Analysis

BML / XBML

scaling

OOS

C2 Interoperability

CAPES / MC2

Environment – Systems Interaction
Interoperability

CMN Focus

BTRA

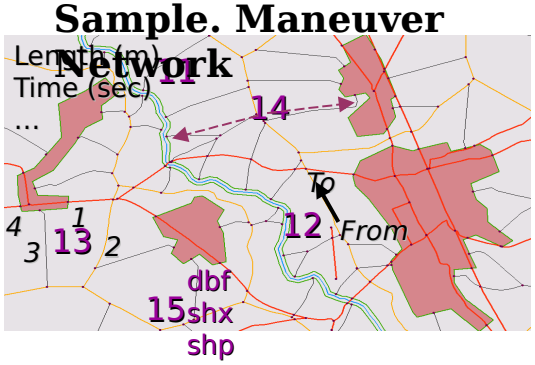
C/JMTK

OOS
Network
Attributes:

- surface material
- ...

environment

behaviors



BTRA
Network
Attributes:

- vehicle speed
- corridor width
- cover
- ...

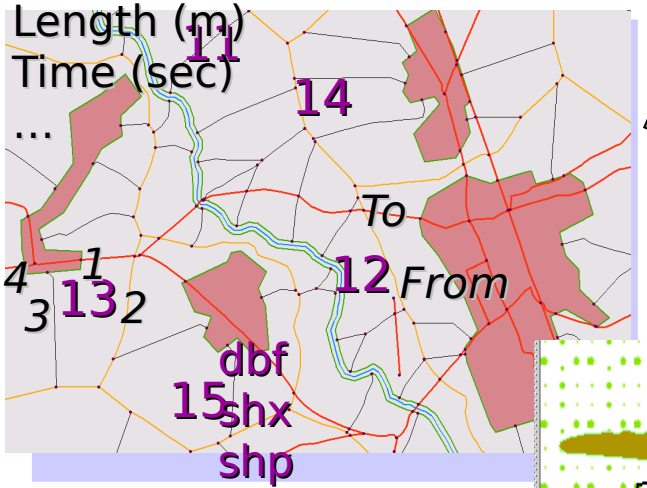
consistency

Approach

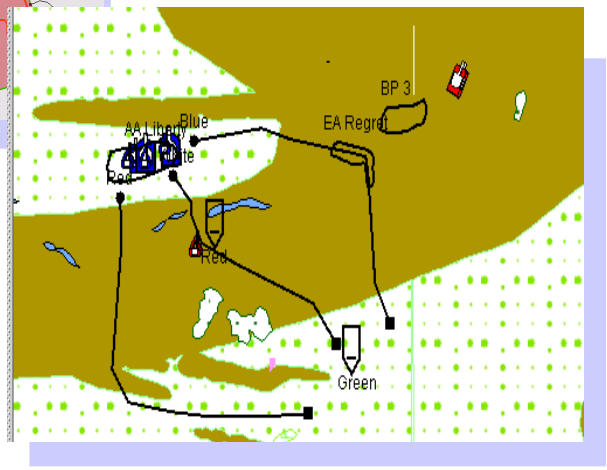
- **Project thrusts:**
  - **Develop a means of inserting BTRA maneuver networks and maneuver products into OOS**
  - **Develop a recommended schema for broader community use (includes examining extensions of C2IEDM and identifying special cases)**
  - **Determine sufficiency of BTRA networks to support SAF behaviors and functions and recommend path forward**
  - **Develop scaling and adaptive algorithms between entity and aggregate level maneuver networks**
  - **Develop a methodology for providing results of OOS courses of action, etc., to C4ISR applications**

Approach, Cont.

Sample BTRA Maneuver Network



Substitute Info Products



Provide Results as Info Products (e.g., from COA)

Sample OOS Simulation Run

OOS Block B ERC Road Segment Attributes

- **Sample Road Segment**
  - **Start node (x y z) end node (x y z)**
  - **Location Category = 8 (On Ground Surface)**
  - **Track / Lane Number = 2 (int value)**
  - **Median Category = 2 (Without Median)**
  - **Name = ROUTE 63 (string value)**
  - **Road / Runway Surface Type = 1 (Hard / Paved)**
  - **Source Type Code = 105 (VMAP1)**
  - **Surface Trafficability Group, JSIMS Mobility Model = 742 (Transportation: AP030 Road; RST: Hard / Paved)**
  - **Object Identification Number = 2756 (int value)**
  - **Minimum Traveled Way Width = 10.0 (linear value)**
  - **Weather Type Category = 1 (All Weather)**

BTRA Road Segment Attributes

- **Sample Road Segment Attributes (not exhaustive)**
  - **Object ID**
  - **Shape**
  - **EDGE_CAT (edge type used for weights - concealment inherited from NoGo)**
  - **SPEED (ground vehicle speed)**
  - **Obstacle_Code (identifies type of obstacle)**
  - **CTL_Vehicle (vehicle used in speed predictions)**
  - **Width (corridor width)**
  - **EDGE_ID (BTRA unique ID)**
  - **T_Node (to node)**
  - **F_Node (from node)**
  - **EDGE_LENGTH (length of edge)**
  - **CAPACITY**
  - **DYNAMIC_COST (used for cumulative cost)**

Summary

- **Year to date – where we are:**
  - **Developed draft Concept of Operations for CMN tools**
  - **Obtained BTRA v 1.0 and OOS Block B (and participated in Block Release Test)**
  - **Reviewing data models, features and attributes for these along with C2IEDM, Battle Management Language, and other initiatives to develop recommended schema and identify unique factors**
  - **Successfully exported BTRA route from shape file to OOS as a control measure line (base procedure)**
  - **Working maneuver network swapping tools/ methodology between BTRA and OOS (expanded procedure)**
  - **Exploring utility of GML or other technologies**
  - **Working with SIMCI OIPT community on project development and direction**

Summary

- **Year 1 (FY04) End State:**
  - **Working demonstration of exporting a BTRA network to OOS Block B for scenario execution**
  - **Phase I recommendations for XML schema to support maneuver (standards focused to support broader community)**
  - **Concept of Operations (living document)**

Summary

- **Challenges**
  - **BTRA and OOS are developmental programs (changes and maturity of functionality)**
  - **Bridging communities to work towards reusable and more global solutions**
  - **Obtaining databases for the same area from the same source data for BTRA and OOS (currently we have identified Korea and Straits of Hormuz but the source data differs)**
  - **Lots of unknowns**

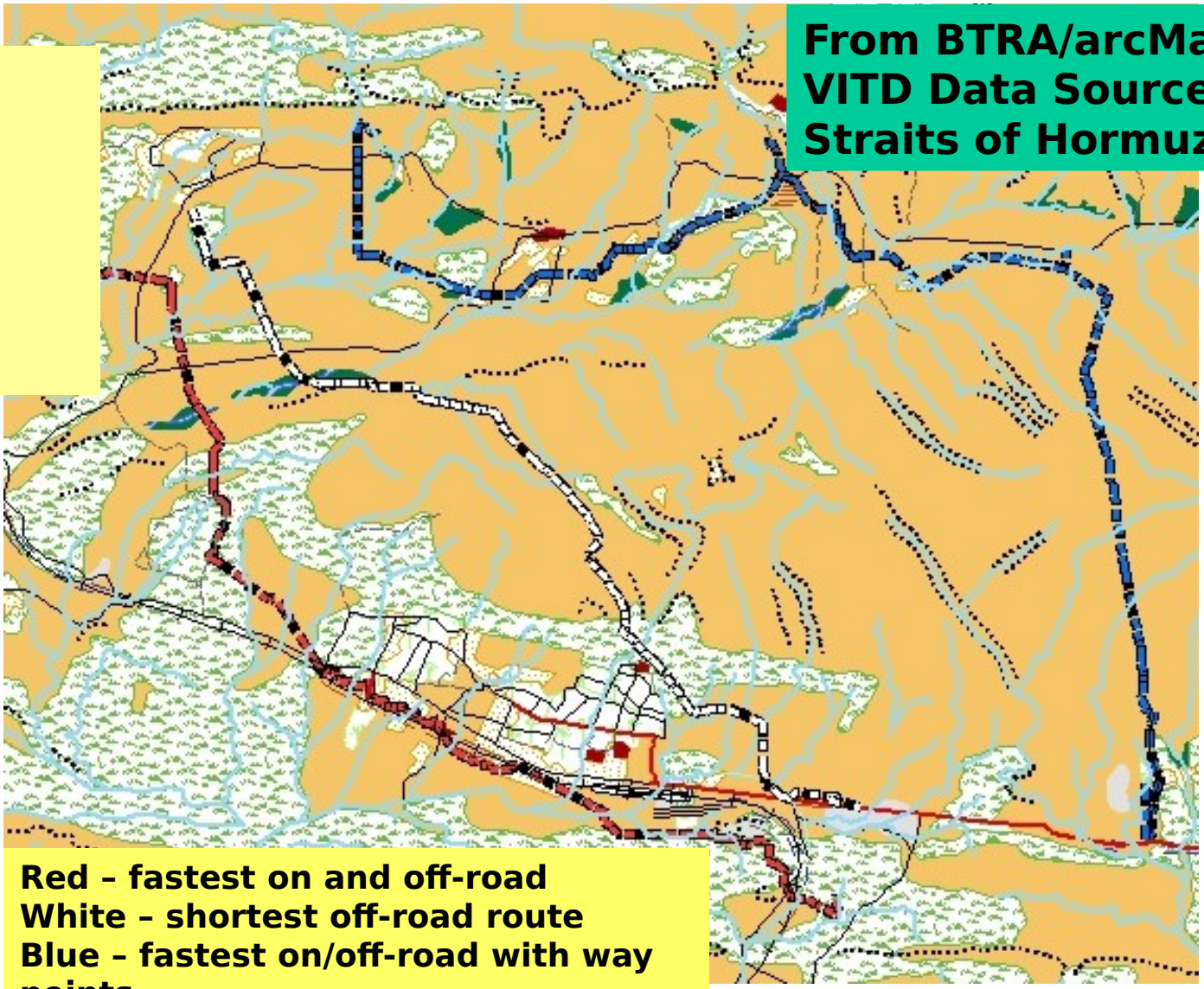
Backups

Example: Inserting a BTRA Vehicle Route in OOS as a Control Measure Line

- **Using BTRA/arcMap generate a maneuver network (*function of: terrain, ground state, vehicle*)**
- **Using this maneuver network, generate a route feature (start, end points, way points, minimum distance or time) and export as a shape file**
- **Read and translate the route shape file segment end points (Lat, Lon) to GCC coordinates using open source and ERDC developed code**
- **Write out a file in OOS control measure (XML) format using ERDC code**
- **Manually insert the control measure into an existing OOS scenario file**

Example, Cont.

Routes generated by BTRA/ArcMap using OOS scenario as a guide

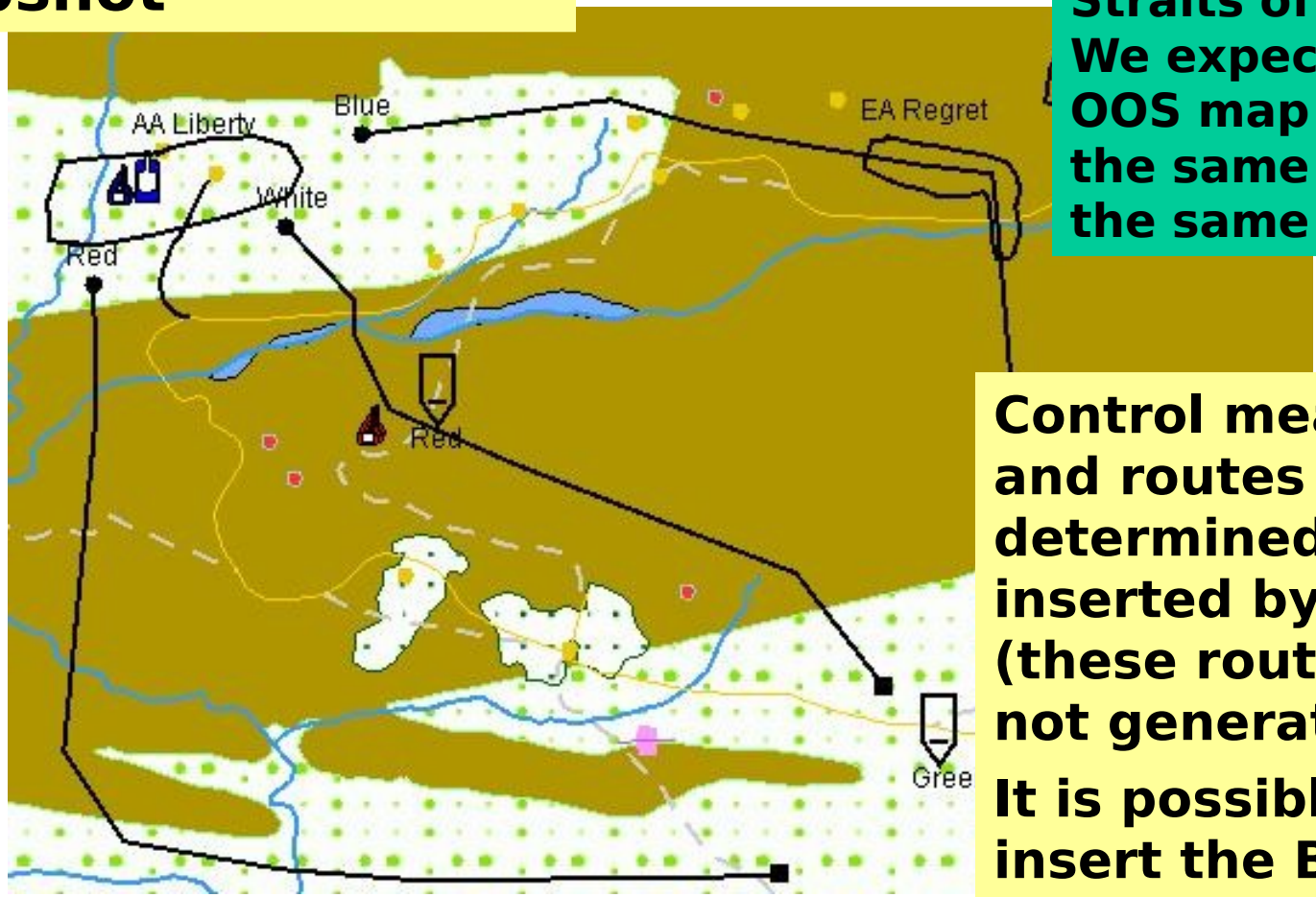


From BTRA/arcMap VITD Data Source - Straits of Hormuz

Red – fastest on and off-road
White – shortest off-road route
Blue – fastest on/off-road with way points

Example, Cont.

OOS Scenario Snapshot

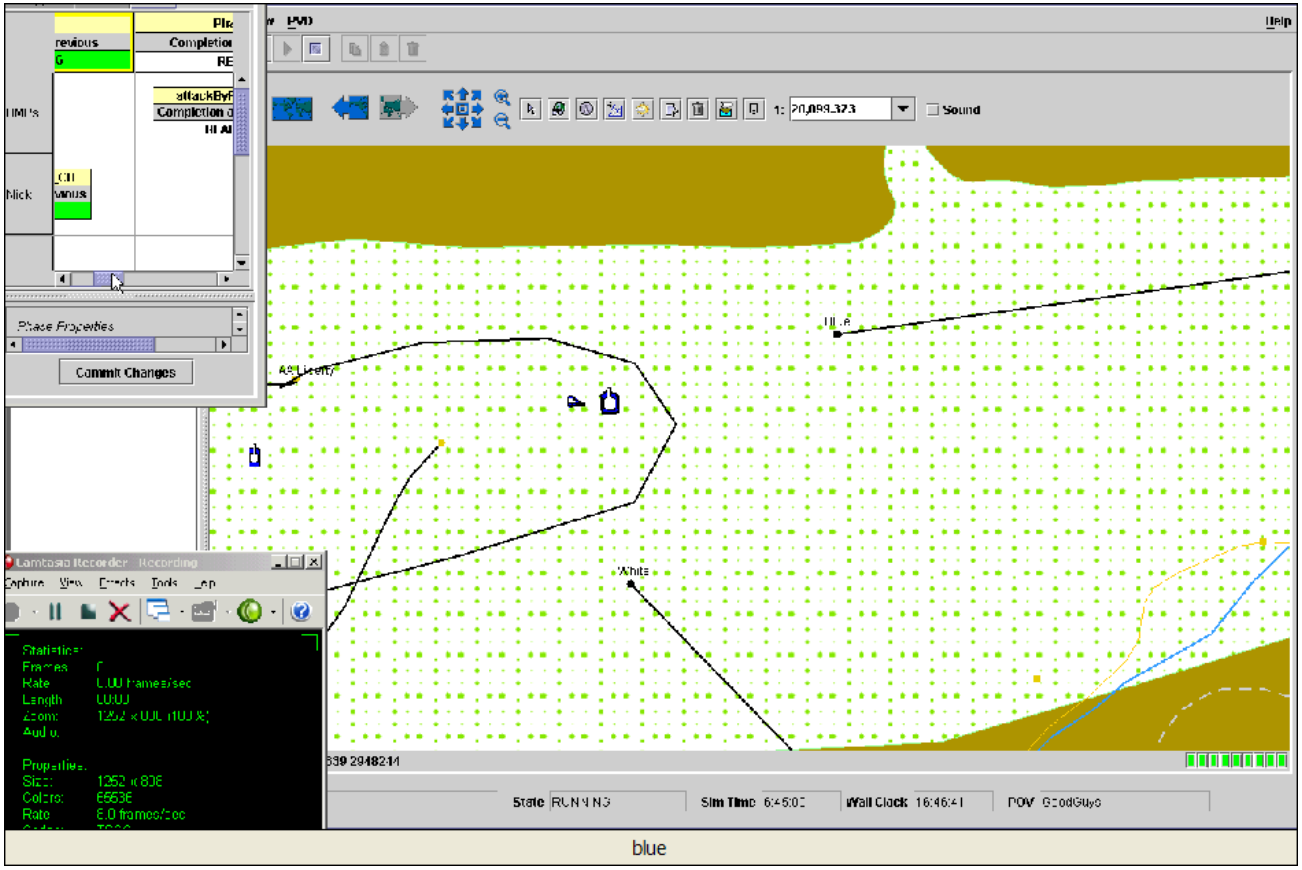


VMAP Data Source at WARSIM resolution – Straits of Hormuz. We expect BTRA and OOS map displays loc the same when using the same source data

Control measures and routes determined and inserted by user (these routes were not generated by

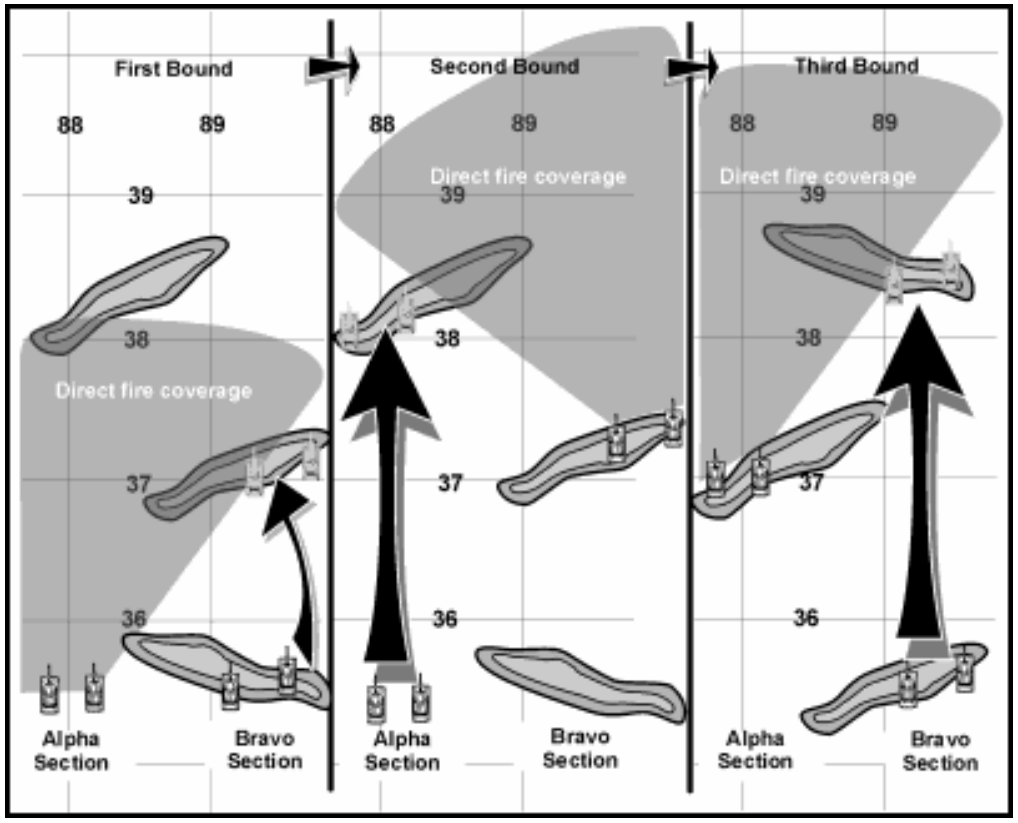
It is possible to insert the BTRA routes into OOS scenario

Demo



Behavior Issues

- ***Bounding over-watch*** **is used when contact with the enemy is expected.**
- **Factors to consider for each movement technique are control, dispersion, speed and security.**
- **Movement techniques are not fixed formations. They refer to the distances between soldiers, teams and squads, and vehicles that vary based on mission, enemy, terrain, visibility and any other factor that affects control.**



See e.g., FM 7-7J;
From OOS Task Description "Move Tactically Bounding Overwatch"